Chia seed mucilage as fat replacer in beef patties: Effects of technological properties

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Introduction: Meat and meat products are sources of protein, vitamins, and minerals with high biological value. Nevertheless, they contain high levels of saturated fats and cholesterol that are risky for cardiovascular health and some cancer types. With the changes in consumer awareness, increased affinity to the consumption of low-fat and healthy food has accelerated (Serdaroğlu, 2006). To reduce the fat content in meat products chia mucilage(CM) is a promising fat substitute due to both emulsifying and water-retaining properties (Muñoz et al. 2013). There is no study investigating the use of chia mucilage in meatball-type meat products. Considering all of these, this study was designed to investigate the effects of CM on the chemical composition and technological characteristics of beef patties.

Materials and methods: Chia mucilage was prepared according to methods developed by Câmara et al. (2020) and Brütsch et al. (2019). Beef patties were formulated with four levels of beef fat and chia mucilage as follows: 20% beef fat+ 0% CM (C), 15% beef fat+ 5% CM (C25), 10% beef fat+ 10% CM (C50), and 5% beef fat+ 15% CM (C75): Minced meat was mixed with beef fat/CM, and other additives (2% salt, 2% spice mixture) in a mixing machine (Mateka, Turkey) until a homogeneous mixture was obtained, then the beef patties were shaped. Subsequently, shaped beef patties were cooked for 10 min with an electrical grill (Sinbo, Turkey) at 180°C to analyze cooking properties. Moisture and ash contents of the patties incorporated with CM were determined by AOAC (2012) procedures. Protein content was analyzed using an automatic nitrogen analyzer (FP 528 LECO, USA) based on the Dumas method. Fat content was calculated by a method stated by Flynn and Bramblett (1975). The water holding capacity(WHC), volumes of total expressible fluid (TEF), and the expressible fat (EFAT) were determined according to Hughes et al. (1997) with modifications. The cooking yield and change in diameter were calculated after cooking (Murphy et al., 1975; Pinero et al., 2008).

Results: The moisture content of samples has been affected by the addition of CM more than 50% ($p<0.05$). C and C25 patties showed the lowest moisture content while C75 had the highest. These results were probably sourced by the high water content of chia mucilage (89.36%). C and C25 had similar fat content. 10.85% (C75) and 12.28% (C50) were the lowest fat contents ($p<0.05$). Similar results were also reported in model system meat emulsions formulated with chia mucilage (Câmara et al., 2020). WHC of beef patties varied between 59.91-72.99%, It was observed that the WHC of samples increased by the addition of CM due to the high dietary fiber content of chia seeds. EFAT varied between 22.19 and 32.22% and was significantly affected by the addition of CM. The increasing of CM content in the formulation of beef patties has increased both water and fat retention. The addition of CM affected the cooking yields of beef patties, cooking yield was higher in beef patties formulated with chia mucilage ($p<0.05$). C, C25 and C50 treatments showed similar diameter reduction the highest reduction in diameter was seen in control samples formulated without chia mucilage.

Conclusions: In our study, it was seen that the use of chia mucilage as a fat replacer enhanced technological properties such as water holding capacity, emulsion stability, and cooking-related properties due to the high dietary fiber content of mucilage.

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